ORGANIZATION OF CONTROL OF PASTEURIZATION

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Read before Joint Session of Section on Public Health Administration with Laboratory and Food and Drugs Sections, American Public Health Association, at New Orleans, La., October 29, 1919.

THE experience of the Chicago Department of Health in the enforcement of a comprehensive pasteurizing ordinance during the past seven years has presented an excellent opportunity for the study of methods of control. It has been possible during a long continued period of observation to test out the various control procedures and judge their efficiency by the ultimate results accomplished. The outcome of this period of experimentation has been the adoption of a general scheme of organization and the development of a stnadardized plan of procedure which now appear to be of proved value. The methods herein outlined, therefore, may be said to have been found effective as applied to the control of a milk supply of 215,000 gallons daily* derived from 18,000 farms, pasteurized in 456 pasteurizing plants and distributed through 603 milk depots. Ninety-eight per cent of the milk supply of the city of Chicago is now pasteurized. The remaining two per cent represents the amount of certified milk distributed in this market.

The control of pasteurization is basically a bacteriological problem. The effectiveness of such control will depend in last analysis upon the extent to which sound bacteriological principles are applied in its solution. Success is conditioned, therefore, upon the close coordination of the inspection division with the public health laboratory. Efficient laboratory service is required not only for the examination of routine samples but for the education of the inspecting personnel, and for the guidance of scientific matters of those responsible for the direction and planning of the work.

*As of the year 1918.

ORGANIZATION OF FORCE

The inspection force proper will be considered in three general groups: the milk inspector, representing the rank and file of inspector; the field plater, who is selected for work requiring a certain amount of technical skill; and the bacteriologist, who is required to repeat and confirm the work of the other groups in selected instances.

The Milk Inspector.—The milk inspector, or rank and file of inspector, engages exclusively in field work. His duties include general inspection of depots, plants, and wagons, scoring of plants, and collection of routine samples. Many of these men necessarily have little or no technical training. They cannot be expected, therefore, to master fully the bacteriological technic of sampling. They should be assigned to the laboratory for a two-weeks' course of instruction before taking up their duties and should also receive instruction in field work at the hands of some member of the inspecting force. Such bacteriological work as is participated in by them must necessarily be accepted with reservation and subject to confirmation by more fully trained technicians. The number of such inspectors employed should be about one to each 25 pasteurizing plants, if we allow for other duties such as depot and wagon inspection.

The Field Plater.—Among the rank and file of field men there will always be found certain ones who possess aptitude for laboratory work by reason of preliminary education or natural technical ability. Such men are selected

after a period of observation and are given a six weeks' course in the Bureau of Laboratories where they are instructed in bacteriological plating methods and are specially trained in the technic of using the field plating outfit.[1] These inspectors may be regarded as intermediate from the standpoint of technical training between the milk inspector and the bacteriologist proper. Their duties include both field work and laboratory work and their time is chiefly spent in passing upon new installations and inspecting plants which are more or less unsatisfactory. The number of field platers is about one-third that of the milk inspectors.

The Bacteriologist—The bacteriologist is a member of the laboratory force, specially trained in milk bacteriology, who is detailed by the laboratory from time to time to the inspection division. His findings are used for final confirmation of the results of tests by inspectors and for preparation of cases for suit in court. One such bacteriologist is usually sufficient for a given health department organization.

The Supervising Inspector.—There should be one supervising inspector to each 25 inspectors, approximately. He is assigned to a supervisory district and is held responsible for the apportionment of work to inspectors, the reviewing of reports, and the checking of assignments. He reports directly to the division chief or person acting in the capacity of division chief. An office force is required to file reports, check thermo recorder charts, send out notices, report results of tests, and attend to miscellaneous correspondence.

PLAN OF PROCEDURE

Initial Installation of Pasteurizing Plants.—The initial installation of a pasteurizing plant gives occasion for the application of four general control measures: (1) approval of the plan of construction and site of building; (2) inspection and scoring of the establishment after completion; (3) testing of the heating device, holding device, sterilizing facilities, and thermo recorder; (4) issuance of a license or permit under which the plant may legally operate.

The construction of a new plant or remodeling of an old one offers an opportunity for plan approval whereby errors in construction and sanitary arrangement may be avoided or corrected with a minimum of expense to all concerned. An expert plan examiner should be assigned to this work, and previously approved plans may be furnished for guidance in construction. The plans should be laid down with certain fundamental principles in mind such as:

(1) Convenience in arrangement facilitates the use of proper bacteriological methods.

(2) Smooth surfaced impervious materials are most readily kept clean.

(3) All pipes and apparatus should be arranged so as to be easily accessible for cleaning.

(4) Long runs of piping for carrying milk should be avoided because of their tendency to accumulate filth favorable to bacterial growth.

(5) When possible the sterilizer capacity should be sufficient to permit the treating of all utensils at one time as a last step in the daily routine, after the cleaning of equipment and premises is finished.

(6) Living quarters, locker facilities, and toilets must be separate from the rooms in which milk is handled.

(7) Adequate light and ventilation are prime essentials.

Inspection and Scoring.—Inspection and scoring of the completed plant is ordinarily carried out by the milk inspector. For this purpose a score card is provided for depots and pasteurizers. Plants should score at least 75%

1. Tonney & White—A Field Plating Outfit, etc. A. J. P. H., Vol. VIII, No. 8. p. 582.

before approval for operation is given. The inspector makes a detailed record of necessary structural changes and sanitary improvements and records a recommendation for approval or disapproval of the plant. Such orders and recommendations are transmitted to the supervising inspector for review and confirmation and are thereupon passed to the chief or assistant chief executive of the division for final disposition. Approved orders are then mailed to the plant or licensure proceeded with as the case may be.

Testing of Apparatus.—The testing of the heating and holding apparatus is commonly carried out by the field plater. He tests the temperature with a standardized thermometer, times the holder, and takes samples of milk at various steps in the process, using his field plating outfit. The plates are taken to the laboratory for incubation and are counted by the same inspector after the incubation period. If the equipment is thereby shown to be capable of giving satisfactory results, a recommendation for its approval is recorded by the inspector and transmitted to the inspection division. If not, the bacteriologist proper is assigned to confirm the findings of the inspector. His recommendations must be complied with and compliance verified by subsequent inspection and tests before license is issued.

The testing of the holding device when the milk is held "in batch" consists ordinarily of recording the time interval, and taking the temperature at the beginning and end of the heating period, using a standardized thermometer. In the case of continuous flow holders the methylene blue test is applied, the time being taken at the outset and again at the first appearance of the dye at the outlet of the machine. Many continuous flow machines have been discarded because of their inability to pass this test. The inspector also tests the recording thermometer by placing the thermometer of the instrument in a pail of hot water, varying the temperature by addition of cold or hot water, and checking the recorded temperature with his standarized thermometer.

Licensure.—When a satisfactory record is obtained with respect to the previously prescribed tests license is approved. For plants within the jurisdiction of the municipality a double licensure is recommended, i. e.,

(1) A general license issued by the mayor or chief executive for a fee, authorizing the sale of milk; and (2) a permit issued by the commission of health without fee for the operation of a pasteurizing plant. For plants located outside the municipal jurisdiction a permit only is issued. Both license and permit have a tenure of one year and are revocable for just cause by the issuing authority.

GENERAL CONTROL OF CITY PLANTS

For convenience in discussing city plant control the subject matter will be treated under the following headings: (1) Inspection and scoring. (2) The hearing board. (3) Reporting of contagious diseases. (4) Sampling. (5) Court process. (6) Revocation of license.

Inspection and Scoring.—A routine inspection and scoring should be made of each plant by the milk inspector once in two weeks on an average. Unsatisfactory plants should receive attention more frequently, whereas plants known to be conducted satisfactorily may be seen at longer intervals. The score is made upon the regular card. A score of at least 75% is required. The inspector records orders for the abatement of insanitary conditions or the correction of unsatisfactory methods. These orders are turned in to the supervisor for review and transmitted to the office for issuance, a time limit for compliance being set in the

order. A reinspection is made after the expiration of the time limit and in case of non-compliance the dealer is summoned to appear before the hearing board.

The Hearing Board.—The hearing board, which consists of representatives of the health department and legal department of the city government, is convened at regular intervals for the purpose of allowing violators of sanitary ordinances a preliminary hearing and making reasonable adjustments without resort to court procedure. At the hearing a further time extension may be allowed, or, in the discretion of the board, the case may be recommended for suit. The hearing board which was established in Chicago in 1915 by Dr. John Dill Robertson has adjusted many thousands of cases, thus securing early compliance without the costly and time-consuming court process. The number of cases heard by the hearing board, including food and sanitary cases other than milk, is 24,583 and the number of cases recommended for suit is 7,843.*

Reporting of Contagious Diseases. Under the terms of the Chicago ordinance, milk dealers are required to report to the health department the existence of any contagion developing among their working force or their families. In practice, however, it becomes necessary to rely chiefly on other sources for this information. Within the municipality the official reports of physicians to the health department, the laboratory findings on specimens submitted for diagnosis, and information obtained by quarantine officers and food inspectors constitute the main sources of information. With regard to major contagious diseases, routine tabulation of the milk supply is made from the reports of physicians and quarantine officers and when an excessive number of cases appears chargeable to a given dealer a special investigation is made with the object of discovering contagion in or about the establishment.

When persons infected with contagious disease or who are carriers of disease are found they must be excluded from work in connection with the pasteurizing plant or its distributing agencies. When contagion exists in the family of a worker he may be permitted to continue work if he establishes living quarters away from the infected premises. When contagion exists on the premises where pasteurizing is done, continuance of business may be permitted provided that the milk is taken to another plant for pasteurization and all work done by persons who have not been exposed to contagion. When evidence of the existence of an unknown infecting focus appears in connection with a pasteurizing plant, the establishment is shut down pending investigation of the source of infection.

The Thermo Recorder.—The thermo recorder chart, taken in conjunction with routine inspection, may be accepted as evidence of the proper operation of the heating apparatus and holding device. When practicable, the charts should be collected by the inspector but may if necessary be nailed to the inspection bureau. On receipt at the Central office, they are checked up by an inspector who should be an experienced field man preferably familiar with the general layout of the plants whose records pass under his scrutiny. When deviations are found in the temperature records, the attention of the field force is directed to the plant and in the case of recurrence, a shut-down of the plant may be necessary.

Sampling.—Bacteriological sampling of milk for control purposes falls into three principal groups: (1) primary routine sampling by the milk inspector; (2) secondary "follow-up" sam-

* As of Jan. 1, 1919.

pling by the field plater and (3) final sampling by the bacteriologist.

The primary routine samples constitute the largest group of samples collected. They are taken by the rank and file of milk inspector. In Chicago from 50 to 75 such samples are collected daily from milk depots, stores, wagons, and receiving platforms. The results serve to indicate in a general way the plants which are in need of closer attention. These findings, however, because of the long interval between collection and examination of the sample and because of the limitation of the average inspector's technic must be accepted with reservation. They should be considered as confidential information for use of the department only and should not be given out to dealers or used as a basis for suit or revocation of license. In the laboratory the simplest possible technic is used, with the idea of examining as large a number of samples as possible. To this end, two dilutions only are plated from each sample. The actual count of the colonies, therefore, often falls above or below the limits of the dilution, making estimation necessary in lieu of counting. We have attempted to simplify further the laboratory technic of primary sampling by trying out the Breed method of direct examination of milk.[1] It was found, however, that the method is not adapted to milk of the age at which it commonly reaches the city and is especially unsatisfactory as applied to pasteurized milk. Its disadvantage lies in the fact that dead organisms apparently take the stain and cannot be distinguished from the living. The result is that the direct count shows enormously greater numbers of bacteria than the plate method required by the ordinance. In fact, in such milk as we have had to examine there is apparently no relation between the results of the two methods of counting. For this reason, we have found it necessary to abandon the direct method as unsuitable for control purposes under the conditions encountered. Table No. I indicates the discrepancies observed between the direct count and the count by plating.

1. N. Y. State Jour. of Med. Vol. 19, No. 4, p. 184.

TABLE NO. I
SHOWING NUMERIC RELATION OF BACTERIA FOUND IN MILK BY DIRECT MICROSCOPIC METHOD AND BY PLATE METHOD

Laboratory Number	*Direct Method*	*Plate Method*	*Ratio Direct to Plate Count*
200	44,500,000	2,000,000	22 to 1
197	13,500,000	400,000	33 to 1
318	10,000,000	50,000	20 to 1
199	467,500,000	800,000	584 to 1
652	38,000,000	150,000	253 to 1
198	51,500,000	90,000	572 to 1
317	32,000,000	100,000	320 to 1
742	47,500,000	750,000	66 to 1
756	79,000,000	500,000	158 to 1
315	20,500,000	80,000	256 to 1
263	113,500,000	500,000	227 to 1
265	8,000,000	65,000	123 to 1
266	35,500,000	1,000,000	35 to 1
262	8,000,000	350,000	23 to 1
653	4,500,000	80,000	56 to 1
319	2,500,000	45,000	55 to 1
388	276,500,000	250,000	1106 to 1
386	25,000,000	1,000	25000 to 1
385	12,500,000	850,000	14 to 1
384	4,000,000	200,000	20 to 1
345	72,000,000	4,000,000	18 to 1

Secondary "follow-up" Sampling.—The secondary sampling is carried out by the field plater who is assigned to those plants which are indicated by the primary sampling to be in an unsatisfactory state. The number of such samples examined in Chicago is about twenty per day. The purpose of the secondary sampling is to locate the sources of contamination and to give instruction to the dealer in the proper methods of operation. The inspector remains at the plant during the entire process, observing methods, inspecting equipment, and sampling at each step. He plates his samples on the premises using the field plating outfit, thereby demonstrating the elementary principles of bacteriological technic for the benefit of the plant workers. The plates are brought to the laboratory and after incubation are counted by the same inspector. Later he returns to the plant for the purpose of eradicating the sources of contamination, indicated by the results found. The results of secondary sampling may be considered more reliable than those of the primary

sampling and may be reported to the dealer. They are not, however, sufficiently dependable for court purposes. It has been found that the majority of unsatisfactory plants may be successfully handled by the field platers. The few remaining intractable ones are referred to the bacteriologist for confirmatory sampling, the results of which are used as a basis for court proceeding.

Final Confirmatory Sampling.—The final confirmatory sampling is carried out by the bacteriologist assigned from the laboratory. He confines his attention to persistently unsatisfactory plants which have resisted all previous efforts of correction. The technic of these tests is quite elaborate and all of the technical details specified in the ordinance are painstakingly carried out. Every possible precaution is used to safeguard against error. The samples are taken in the final containers only, delivered iced to the laboratory within one hour, plated immediately in a range of five dilutions in duplicate, incubated for a timed period of forty-eight hours and accurately counted. Controls are run with all tests, the pipettes are callibrated and the amount of culture medium used in each plate is measured. The results will therefore stand the test of cross-examination by experts. On account of the amount of work involved in this test the number of such samples should be limited to about four daily if one bacteriologist is employed. It should be noted that the results obtained by this strict technic are commonly much lower than the previous results obtained in the same plants by the inspecting personnel. Table No. II shows the comparative results of primary sampling by the milk inspector and final sampling by the bacteriologist. The table has been abbreviated in the interests of economy of space.

TABLE NO. II
RESULTS OF PRIMARY ROUTINE SAMPLING AND FINAL COURT SAMPLING COMPARED

	Date	*Rout. Samples*	*Date*	*Final court samples*
	4–18–19	450,000		
Plant A	1–22–19	60,000	5–21–19	50,000
	6–14–18	Too numerous to count		
	4–28–19	200,000		
Plant B	4– 9–19	650,000	5–21–19	400,000
	5–20–19	450,000		
	4– 2–19	200,000		
Plant C	10– 2–18	100,000	5–21–19	25,000
	9–10–18	70,000		
Plant D	4–18–19	400,000		
	12–17–19	380,000	5–22–19	400,000
	4–22–19	300,000,000		
Plant E	12–19–18	350,000	5–22–19	5,000
	12–19–18	100,000		
Plant F	4–23–19	200,000		
	3–28–19	40,000	5–22–19	120,000
Plant G	4–22–19	200,000	5–22–19	150,000
	3–22–18	50,000		
	4–22–19	5,000,000		
Plant H		4,000,000	5–23–19	100,000
	12–19–18	Too numerous		
	4–21–19	200,000		
Plant I	1– 7–19	Too numerous	5–23–19	25,000
	1– 7–19	40,000		

Court Process.—The number of instances in which court process must be resorted to under the plan outlined is small, since other means are previously exhausted and only persistent violators resistant to other measures reach this stage in the program. About 30 suits for high bacterial counts have been brought to trial in Chicago during the two years passed. While the rule is that the ordinance is commonly upheld, it must be admitted frankly that the court process, as a control measure, is not entirely satisfactory. The procedure is time consuming and costly in effort. There are many loop-holes of escape before the case is finally disposed of in court. The fines imposed also are frequently too small to be effective. The method, however, as a whole, is of distinct value, as the knowledge that suits are being brought has a corrective effect upon the industry.

Revocation of License.—A more satisfactory method of dealing with old offenders which has recently been used extensively with good effect by the Commissioner of Health of Chicago is the revocation of licenses. By this method pasteurizing plants which have long been unsatisfactory are suddenly confronted with summary interruption

of business. The doors are padlocked and a police detail is stationed on the premises. The result is the display of remarkable alacrity in carrying out orders for the improvement of sanitary conditions. Repairs which have been pending for months are accomplished over night. Old nuisances are abated, flies are kept out of the premises, the methods of operation are improved and bacterial counts in the product which have been persistently above the legal standard suddenly drop to a satisfactory level. In fact, the prompt response and resulting necessity of early renewal of license has lately led the Commissioner of Health to adopt the practice of serving a 24 hour notice before revocation. It is found that this notice often obviates the necessity of revocation because of prompt compliance with regulations. It should be borne in mind further that the results cited are accomplished with a minimum of effort and in record breaking time.

The annual renewal of licenses also constitutes an effective means of enforcing sanitary requirements. It is the practice to secure an inspection and scoring of all premises shortly before the expiration of the license period. Plants found to be below standard are not given renewals until conditions are made satisfactory.

CONTROL OF COUNTRY PLANTS

The methods of control of pasteurization, as used within the city, require some modification when applied to plants located outside the boundaries of a municipality.

Inspection and Scoring.—A dairy inspector or creamery inspector is required to visit country plants at least once each month. The number of such inspectors should be about one to each 15 plants, approximately, if time is allowed for dairy duties and other assignments. The card used for scoring is similar to that used within the city. A score of at least 75% should be required. Orders for abatement are forwarded to the department for issuance as in the case of city plants.

Reporting of Contagious Diseases.—Information with reference to contagion among employes of country plants or their tributary farms is obtained in a number of ways. The dealers themselves report a considerable number of cases. The dairy inspectors, the creamery inspectors, the local health officers, and physicians are important sources of information. Rarely the farmer himself reports the existence of contagion. A report of two or more cases in a given locality is followed by investigation in the neighborhood which often discloses additional cases in adjoining farms and nearby plants. Diseases in the herds are commonly reported by the local veterinarians. When a report is received of the existence of contagion in a pasteurizing plant or its tributary farms, the product of the plant is excluded from the market until such time as the case is removed from the premises or the tributary supply is cut off. The return to work of the employee concerned is not permitted until a formal certificate of recovery is obtained from the local health officer. In the case of tributary farms, the shipment of milk to the plant may be allowed if the herds are removed to other premises and cared for by persons not in any way exposed to contagion.

Thermo Recorders.—Thermo recorders are required as in city plants. The charts are required to be mailed regularly to the department of health.

Sampling.—Sampling consists chiefly of field plating at the plants and general primary sampling on arrival of the product in the city.

The "Shut-off."—Perhaps the most effective means of control of plants located outside of the municipal jurisdiction is the "shut-off." This procedure

may be regarded as a temporary suspension of the permit to operate a pasteurizing plant. It is resorted to for reasons such as the following:

1. Non-compliance with orders for abatement of insanitary conditions.
2. Aceptance of milk from other shippers who have attempted to evade a "shut-off."
3. Failure to send thermo recorder charts to the department.
4. Falsifying thermo recorder charts.
5. Failure in the case of a new plant to apply for a permit before shipment.
6. High temperature of milk at the receiving platform in the city.
77. Excessive bacterial content of the milk sampled at the receiving platform.

The "shut-off" is accomplished in the following steps: (1) Written notice is sent to the consignor and consignee; (2) Telephone notice is given to the dairy inspector of the district; the inspector ascertains whether the plant is shipping and reports by telephone to the department, giving the railroad and time of arrival; (3) A milk inspector is assigned to the receiving platform in the city. On the arrival of the shipment, it is returned to the consignor by the milk inspector or held under condemnation tag. The shipper, in order to be relieved of the "shut-off," is required to come to the city or send a representative to interview the executive or assistant executive of the inspection bureau. Here the reasons for the "shut-off" are fully explained and the importance of securing compliance with orders emphasized. When all orders have been complied with and this fact has been verified by inspection of the plant, the "shut-off" is lifted.

Revocation of Permit.—Revocation of permit or refusal to renew the permit at the end of the expiration period is at times resorted to as a means of penalizing repeated disregard of sanitary regulations. This step closes the city market to the plant in question and usually results in prompt compliance with orders issued for abatement of insanitary conditions and improvement of methods.

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Marriage and Disease.—The new Danish Marriage Law is up for its third reading in the Folketing (Lower House) after which it will go to the Landsting (Upper House) for consideration. It contains these provisions:

(1) If the person who wishes to contract a marriage does not suffer and has never suffered from venereal disease, he shall give a written declaration on his honor to that effect.

(2) In the opposite case, he must either put in a doctor's certificate, made within the previous fortnight that the danger of infection or its transmission to the children is most improbable; or

(3) If such a declaration cannot be made, he must prove that the other party to the marriage has been informed as to the disease, and that both parties have had oral instruction from a doctor as to the dangers consequent thereon.

Typhus on Decrease in Esthonia.—Mortality from typhus in the hospitals of Esthonia is on the decrease, according to announcement made by Colonel Edward W. Ryan, head of the American Red Cross Commission to West Russia. From 8 percent to 0.5 percent is the record drop in the number of deaths from typhus registered in five days in some of the hospitals.

The work of cleaning up in the hospitals in Reval has been completed and the commission has begun work at Narva. The Esthonian authorities have given the Red Cross officials every possible assistance. The chief of the commission has expressed himself as confident that the typhus epidemic will shortly be overcome, unless the disease suddenly grows unexpectedly widespread.